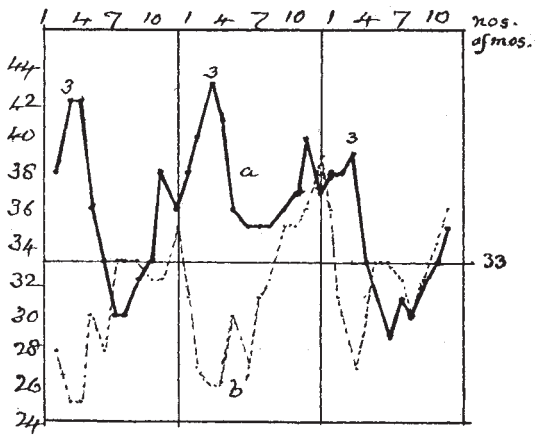
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
(*a*)	11	14	15	14	12	10	13	12	10	14	13	13	=151
(*b*)	11	8	8	10	8	12	7	12	13	10	12	14	=125
(*a'*)		40	43	41	36	35	35	35	36	37	40		
(*b'*)		27	26	26	30	27	31	32	35	35	36		
(*a'*):(*b'*)		+13	+17	+15	+6	+8	+4	+3	+1	+2	+4		

The series (*a'*) and (*b'*) are expressed in curve-form in the middle section of the diagram. Note that the (*a'*) curve culminates in the third month (*i.e.* with the 3-month group February–April), and just then the other curve is at its lowest point. The difference here is 43−26=17 (about 65 per cent. of the lower value).



Curves of total warm months in 3-month groups.

We might extend these curves on either side, considering in one case the temperatures in those years of highest and lowest sun-spot numbers, and in the other those in the second years after.

In both extensions we find, again, the extreme contrast at the third month, but in both, the curves cross each other in part; and in the third section there is general "break-down," with year-difference small. Thus we have, for totals of warm months :—

	Diff.
Years of (22) highest and (22) lowest sun-spot numbers	142−123=19
1st year after	151−125=26
2nd ,, ...	134−130= 4

The sharp contrast above referred to in the early part of the year (February–April) seems to me remarkable, and may be usefully considered in relation to the flowering of plants and other phenological phenomena, the variations in which, from year to year, seem to be connected with the sun-spot cycle (as I have before tried to show).

ALEX. B. MACDOWALL.

RECENT EARTHQUAKES.

THE Italian earthquake still keeps a prominent place in the daily newspapers, and earthquakes still continue in the stricken country, but this is no more than must be expected. Every great earthquake is followed by numerous after-shocks, more frequent at first and gradually becoming fewer and fewer; 949 shocks were registered at Monteleone in 1783, and 159 in 1784. A similar experience is being repeated in Calabria at the present time; reports of more earthquakes at Reggio and Messina are common in the papers, but the record is too incomplete to be worth repeating in detail. Among these after-shocks some have been of sufficient violence to bring down shattered or weakened walls and buildings, and some were of a severity which would have caused serious damage and destruction to buildings had they stood by themselves. The first of these destructive after-shocks seems to have occurred at 7.24 p.m. on January 23, which brought down a good many houses left standing by the earthquake of December 28 at Reggio, and was described as of equal violence. This statement must be accepted with reserve, for experience has shown that after a very great earthquake and during the period when after-shocks are frequent, all sense of proportion is lost, earthquake-fear is developed, and every shock of more than average severity ranks out of proportion to its real importance. Though the shock was apparently a considerable one, and may well have compared in violence with its predecessor at Reggio, yet the much smaller area over which it had the power of inflicting damage, as also the much smaller size of the area over which it was felt, mark it as an altogether minor shock.

Besides the local after-shocks, earthquakes have been reported in the daily papers from other parts of the world, and not unnaturally a connection has been assumed which has probably no foundation in fact. The most important of these were the North American earthquake of January 11, and that in Asia Minor on January 19; the former of these was felt at Victoria, B.C., at 3.55 p.m., local time, and was described as severe; it was also felt at Vancouver and Nanaimo, in British Columbia, and in the Washington State, where some slight damage was done at Port Townsend. The earthquake in Asia Minor seems to have been more severe if not more extensive; it took place at 6.40 a.m. on January 19, and is said to have destroyed 679 houses at Phocœa, two persons are reported to have been killed at Menemen, and the same number at Cassaba. Neither of these was, however, of any importance, and would probably have passed without notice but for the attention directed to earthquakes at the present moment.

Much the same may be said of the shock which shook northern Italy on January 13, though possibly this may have been of the nature of a sympathetic after-shock, that is to say, brought about by a change in the distribution of strains in the earth's crust, consequent on the movements which have taken place in Calabria. It belonged to that little understood class of shocks which affect a large area without anywhere reaching destructive violence, and nowhere did more than trivial damage, though felt at Triest, Trient, Milan, Genoa, Siena, and in all the country between.

In spite of these earthquakes, there is no indication of any real increase in seismic activity; on the other hand, it is a somewhat remarkable fact that the Calabrian earthquake was a solitary one. World-shaking earthquakes almost invariably occur in groups, and are seldom unaccompanied by one or more companions, originating in distant parts of the globe, but within a few hours, or at most a few days, of each other; so frequent is this phenomenon that it has almost been elevated into a law, and an ingenious explanation, with experimental illustration, has been published. In the present instance, the records of Prof. Milne's instruments at Shide show that no other world-shaking shock accompanied the Calabrian one, and none was reported until the morning of January 23, when an earthquake, which probably originated somewhere in western Central Asia, was registered by seismographs in Europe, India, and at the Cape of Good Hope; probably we shall hear more of this earthquake, for its origin was in a region which is not devoid of villages and towns, but the interval which had elapsed prevents our regarding the two earthquakes as companions. This isolation of the Calabrian earthquake may find its explanation in the fact that although a great, it was not a very

great, shock. The extreme diameter of the seismic area did not materially exceed 350 miles, and making every allowance, the area over which the shock might have been felt—including in this the sea—could not have been more than 95,000 square miles; in the Californian earthquake of 1906, the corresponding figure was 372,500, and in the Indian earthquake of 1897 it was 1,750,000. These figures give some idea of the relative magnitude of the three earthquakes, and in the present state of the science it does not seem possible to find a more satisfactory means of comparison.

A point which has attracted notice, and is worthy of attention, is the peculiar weather which accompanied and followed the earthquake. We need not consider the fact that it coincided with the sudden break-up of an equally sudden and severe frost over northern Europe, nor the unusual cold and snowstorms which have followed it in southern Italy. These were due to meteorological conditions of great extent, in all probability unconnected with, and independent of, the earthquake, but the sudden fog which, according to every account, settled on the Straits of Messina stands in a different case. The earthquake in Mexico of January 24, 1898, was similarly followed by a heavy mist, at a time of year when mists are usually unknown, and rainfall is so frequently reported as the immediate successor of an earthquake that we can no longer reject the hypothesis of a real connection between the two. Earthquake weather is a common expression in earthquake countries, but is usually applied to a heavy and oppressive feeling in the air which is supposed to precede an earthquake. Mr. Maxwell Hall has attempted to find an explanation in alterations of the barometric gradient by rapid upheaval of the ground, and has shown that uplifts, which are within the range of possibility, would produce the required effects, but whether there is, or is not, an earthquake weather, in the ordinary sense of the words, there seems reason for believing that in another sense they represent a reality, and that, as has been suggested by Prof. Milne, the disturbance of the ground, when transmitted to the overlying air, may determine precipitation, and explain the apparent association of severe earthquakes with mist and rain. What may be the nature of the influence we know not, but if mechanical, it must be either the result of the vibratory motion of the ground, or else of permanent changes of level, accompanied by the sudden upheaval or depression of the overlying column of air, and of this permanent change of level we are still without any satisfactory evidence. In the accounts which have reached us, quays and pierheads are mentioned as having subsided beneath the water, but there is nothing to show that more than a settlement of made ground has taken place, while the photographs which have been published suggest that this rather than any displacement of the solid ground is the explanation of the apparent subsidence, and the commission appointed to inquire into the changes which have taken place in the harbour of Messina has reported that though the quays have been destroyed in places, no permanent change has taken place which will interfere with the continuation of its use as a port. R. D. O.

GRAVITATIONAL THEORIES.

IT is well known how cultivators of physical science in Great Britain lag behind the most up-to-date philosophical views in continuing to think that valuable light is thrown on physical phenomena by the elaboration and study of mechanical analogies of more familiar type, and more readily grasped by the mind. These matters are, perhaps unfortunately, for us largely the affair of specialists in science, who understand both the value and the limitation of the method.

For example, in the days of the very instructive—and somewhat insular—mathematical development of Lord Kelvin's idea of vortex atoms, the mechanical analogies of gravitation were much to the fore; and in particular Prof. W. M. Hicks elaborated, a quarter of a century ago (*e.g.* in *Camb. Phil. Soc. Proc.*, October, 1879), on the basis of experiments by Guthrie and others, a beautiful theory of how the attractions of gravitation could be imitated by pulsating bodies in a liquid medium. Further developments, theoretical and experimental, of interesting character, with relation also to electrodynamics, were made in the well known experiments of Bjerknes. Indeed, some such notion is the only simple direct mode of imitating gravitation which has presented itself; there is the alternative, of course, that it may be a residual of other more potent actions.

In this regard, the pulsation analogy lies at the back of the heads of most people interested in the subject. But lest we forget, the watchful enterprise of the daily Press in reporting by special correspondence from Berlin the recent exciting revival of these ideas illustrates one of the ways in which it can keep us in touch with the latest developments of science. Doubtless the experimental phenomena reported with so much emphasis will be found eventually to contain much that is interesting and useful as new aspects of this well-worn subject.

MOUNTAINEERING IN NORTHERN NORWAY.[1]

THERE being little left in Switzerland for the mountaineering pioneer, climbers who prefer exploration to gymnastics have been driven further afield. Mrs. le Blond (then Mrs. Fred Burnaby) was one of the leaders in Swiss winter climbing; but after fifteen seasons in the Alps she was induced to visit northern Norway, partly from the desire for virgin peaks and partly to give her well-known guide, Imboden of St. Nicholas, a change of scene after the death of his son on the Lyskamm. This volume records the story of five seasons' climbing amongst the glaciers and peaks of northern Norway near Tromso. The narrative is pleasantly and modestly written, and is occupied by short accounts of the author's twenty-seven first ascents in this district. The country has many advantages over Switzerland; it has the charms of solitude, of freedom, and of being imperfectly mapped and explored; until recently its peaks were unclimbed, and many of them even unnamed.

Mountaineering in northern Norway is free from two Alpine risks. No one can be benighted in this land of continuous daylight, and there is no danger from exposure to cold in the mild climate, repeatedly attributed by Mrs. le Blond to the Gulf Stream, in which her faith is firm and primitive. The country has, however, the drawbacks of long spells of bad weather. On one occasion, for example, two friends arrived at Mrs. le Blond's camp for a few weeks' climbing at the beginning of "five weeks of the very worst weather I have ever seen" (p. 179). The constant mists and clouds add greatly to the picturesqueness of the country, and to them are due the beauty of many of Mrs. le Blond's photographs; but fogs and continual rain may easily prevent any mountaineering except to those who have most of

[1] "Mountaineering in the Land of the Midnight Sun." By Mrs. Aubrey le Blond. Pp. xii+304; map and 71 illustrations. (London: T. Fisher Unwin, 1908.) Price 10*s.* 6*d.* net.